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ROSE TECHNIC

ROSE POLYTECHNIC INSTITUTE
LABOR ET SCIENTIA
1874

OCTOBER, 1939

MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

STEELE '39

Rose Polytechnic Institute opens its fifty-eighth year with increased facilities for engineering instruction. During the past summer extensive improvements have been made in the laboratories for civil and chemical engineering which will greatly enlarge experimental facilities in these fields.

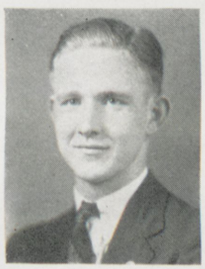
It is not too early for high school seniors to write the Registrar in regard to entrance next September.

ROSE POLYTECHNIC INSTITUTE

TERRE HAUTE, INDIANA

Surveying The Scribes

Charles A. Howlett, junior in the department of electrical engineering, wrote the lead article in competition for the 1939 Toulmin Award. It won first prize. He is assistant editor on the staff of the *Technic* and is also active in other campus organizations including the Rose Rifle Club, the Rose Radio Club, and the American Institute of Electrical Engineers.



William D. Schwab, junior in the department of mechanical engineering, contributed the second feature article, "Recent Trends in Automobile Design." During his sophomore year he was awarded the handbook given by the Rose chapter of Tau Beta Pi to the sophomore who increases his scholastic average by the widest margin.

Edward J. Klecka, junior in the department of chemical engineering, was led to write "Chemicals in War" after hearing Captain Frederic A. Henney, Rose P. M. S. & T., present a talk before the chapter of the American Institute of Chemical Engineers. A former Technic staff member, he won the medal given by the department of military science to basic students for soldierly attainments.

The cover picture was taken during R.O.T.C. field exercises held last May. "Doughboys" shown were members of the Red defensive party. The magic camera of Howard White, civil engineering faculty, did the trick.

The frontispiece depicts the assembly of a gigantic bubble-plate distillation column made of aluminum, shown through the courtesy of the Aluminum Company of America.

THE ROSE TECHNIC

OCTOBER 1939

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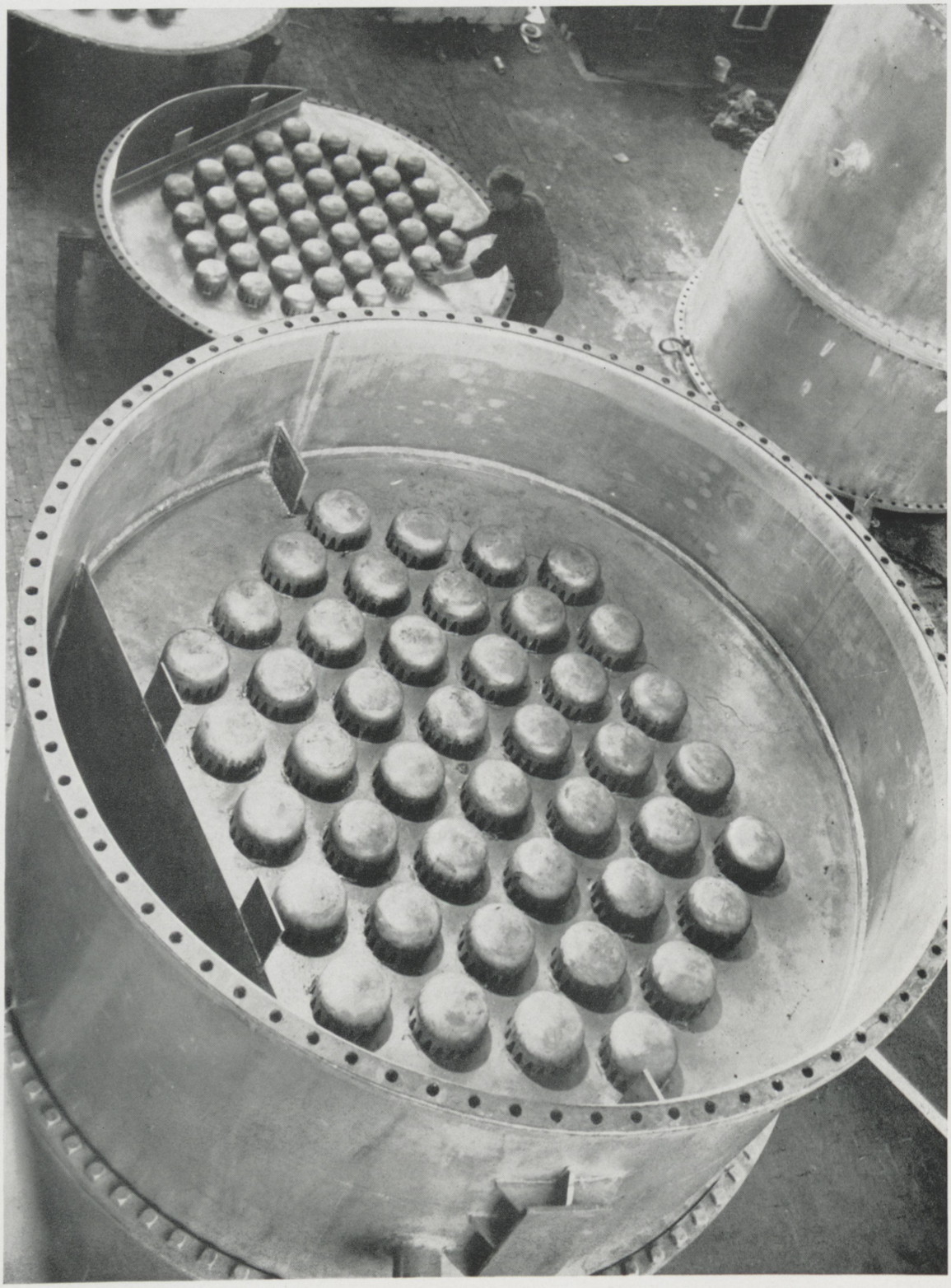


Picking corn can be done 44 per cent more efficiently by machine, but involves a loss of about 30 per cent of the labor employed. Shelling the corn by use of machinery is 9,800 per cent more efficient, and the corresponding labor displacement of 99 per cent is also high. For the process of harvesting hay the machines of 1927 operated with an efficiency of 1,200 per cent over the methods of 1850, but entailed an 84 per cent labor displacement.

In spite of the continual increase in labor displacement, the field of agriculture continued to absorb laborers until after the World War. Between the years 1880 and 1910 there is said to have been a theoretical labor displacement of about 40 per cent; yet, in this same period, the industry took on an additional 3,000,000 workers. Then from 1919 until 1927, although the technological displacement was only about 23 per cent, a serious decline in agricultural employment displaced large numbers of workers. In fact, between 1920 and 1927 the technological displacement is placed at 2,530,000. Dr. Harry Jerome states that actually only some 800,000 workers were displaced because improvements, in the main, were used to increase output rather than to reduce the number of workers employed.

It is of interest to note, along with the increased efficiency of mechanized farming, the relative incomes of the average farm workers. For instance, the average worker of the state of Alabama with only 1.5 horsepower available, and with only $142 invested in equipment of mechanical nature, receives the lowest gross income, totaling $492. In contrast, the average farmer of Nevada, with 9.5 horsepower available, and with an investment of $739 in machinery, receives the highest income of $2,263. Although these are extreme cases, other fragmentary data of this type from other states and foreign countries indicate that increased available mechanical power, within natural limits, tends to increase the income of the agricultural worker.

Mining

Another field of major importance in the study of mechanization and its effects is that of mining. Jerome states in regard to the subject, ". . . This heavy manual work of loading coal has been described as 'the most widespread form of drudgery existing in industry today', and the major current developments in coal mine mechanization are in the way of substituting mechanical for manual loading." The increasing use of strip mining also tends to increase mechanization.

Any attempt to show the actual displacement due to mechanization of mining would require much more accurate data than are now available. The Bureau of Labor Statistics, however, has shown that 70.8 per cent of the persons employed in 1930 could produce the same tonnage of coal in the same time provided the mines were physically adapted to mechanized loading and were otherwise equal in efficiency to many of the mechanized mines now in existence.

The productivity of mine workers has been considerably increased by the widespread adoption of machines. The Bureau of Labor Statistics says that for the years 1910 to 1929 the output per man per day increased 40.2 per cent, and between the years 1910 and 1930 it increased 46.2 per cent. In strip mining processes, which accounted for 4.3 per cent of the total output in 1930, the stripping process was bettered by 217.6 per cent, and the output of all processes was bettered by 36.4 per cent on the basis of output per man per day for the seventeen-year period of 1914 to 1930.

The mechanical changes, especially in the bituminous coal mines, constitute a major technical development and have been greatly criticized. It is said that the mining machines introduce accident hazards; yet, on the other hand, they tend to minimize the tremendous avoidable losses which average 20 per cent or 150,000,000 tons of coal per year in these mines. The most outstanding effect remains that of technological displacement; and although 247,000 workers were eliminated from the industry since 1923, it is of significance to note that this is largely due to changes in demand caused by the competition of fuel oil and gas, and the general business depression. A striking fact in the mechanization of mining is that those bituminous coal mines of Wyoming, Montana, Illinois, and Indiana which have been able to survive intense competition and maintain employment have been those mines that managed to mechanize. Thus, failure to mechanize in the event of severe competition may actually reduce employment more than would the mechanization itself.

Amusement Industry

The amusement industry is another of the non-maunfacturing industries which is often used as an example in showing technological development, especially because of the revolutionary effects brought about by motion pictures. The effect has been greatly to limit the activities of the legitimate stage, musical comedy, and vaudeville. Of the 140 stock companies in existence in the legitimate theatre in 1929, only 80 were still functioning in 1930. Vaudeville is practically a thing of the past, and in the South practically nothing but pictures are shown.

The introduction of sound probably brought about the most serious effect by displacing the theatre musicians. It is estimated that for the two years of most rapid growth of the sound pictures, 1929 to 1931, nearly 10,000 theatre musicians, or 50 per cent of the total, lost their jobs. The general employment in the industry, however, seems to be increasing. Many of the displaced theatre musicians were later absorbed into radio broadcasting, and a study of 13,000 theatres in the United States indicates that they have employed approximately 10,000 additional workers. Also, the President of the International Alliance of Theatrical Stage Employees and Moving Picture Machine Operators states that from 1926 to 1931 the

(*Please turn to Page* 26)

The Effects of Inventions on Employment

by Charles A. Howlett

This paper of Mr. Howlett's won the 1939 Toulmin Award.

Several representative industries, and the effects of invention on the employment in these industries, are considered. The problem relating invention and labor is stated. The fact that invention, though displacing many laborers in certain industries, is also creating many new industries which could absorb these displaced laborers if the above-mentioned problem were solved, is also discussed.

Introduction

A BANKER once defined invention as that which made his securities insecure. Invention is a great disturber; in fact, it is said that invention is probably the greatest cause of change in our modern civilization. In this paper, more specifically, it is the changes which have been wrought upon employment by the introduction of labor-saving machines and techniques which will be considered. Ever since the beginning of the industrial revolution, during any period of general unemployment, the discussion of this subject has been raised. David Weintraub says, "The economic literature of the past two centuries is interspersed with debates concerning the effects of the increasing use of machinery on the volume of employment."

Later in his discussion Mr. Weintraub says:

"A full investigation of the effects of changing technology on the volume of employment and unemployment would involve an analysis of the effects of changing prices of goods and services, of changing costs of capital and labor and the changing proportions of each employed in the production process, of changing demands for goods and services, and of a multitude of other factors which play an important part in determining the profitableness of employing workers."

Naturally such a complete presentation of the problem is impossible within the limits of this paper; but it is possible to show some significant figures on the volume of technological displacement; increase of productivity; volume of output; growth of the labor supply; and, on the other side of the question, some of the beneficial effects that inventions have brought about.

Many of the terms used throughout this paper are not immediately self-evident and perhaps would be clarified by the definitions established by the Bureau of Labor Statistics. "Productivity of labor" is defined as the work done in a given time, and is ordinarily best expressed as output per man per hour. The advantage of this as a basis for measurement is that it is more precise and exact than other criteria. "Productivity of labor" should be differentiated from "efficiency" which depends upon the ability and the willing cooperation of the workers themselves. The Bureau defines the phrase "technological change" to include all change, whether in the nature of the product, method of production, type of labor, hours worked, or machinery and equipment used, which results in higher productivity per man hour. Usually the object of technological changes is to reduce the labor cost of operation. Naturally this produces a surplus of labor time, and unless there is an increase in the total output, there is an elimination of jobs and workers in the improved plant. This condition is referred to as "labor displacement" or "technological unemployment."

Many studies have been made of the problem of the effects of inventions on employment; and from the methods of attack used by many of the authors cited, it seems logical to proceed by showing these effects in representative industries. In the selection of the industries for examples, it was necessary to use only those for which sufficient data were available. Then from the remaining industries were chosen the ones which would show sufficient diversity to include the more important conditions of the problem. Examples are meant to include both expanding and declining industries.

Agriculture

Agricultural mechanization, although widely differing in the extent of application in different sections of the country, offers much to consider. The increase in efficiency of the farming methods between 1850 and 1927 is especially striking in comparison with the actual and potential elimination of man power. For instance, the efficiency of the latest plowing machine as compared to the one-man, two-horse plow is 5,900 per cent, and the labor displacement is 93.3 per cent. The gain in efficiency of planting corn is 289 per cent and the corresponding displacement is 60 per cent. Harvesting and threshing combined present the almost unbelievable gain in efficiency per unit of labor of 4,700 per cent, but the corresponding potential labor displacement is 98 per cent.

Recent Trends In Automobile Design

by William D. Schwab

Since the automobile is apparently so nearly a perfect machine, it is often wondered just how, and what, further improvements will be made. Mr. Schwab's discussion of the design trend of the three main parts of the automobile, the engine, body, and chassis, gives some hint of what might be expected.

ABOUT twenty-five years ago, automobiles were considered a luxury and only wealthy people were able to own them. Today, the automobile is not only a luxury, but it is a necessity for most individuals. Improvements have been made on the automobile until today it is as nearly perfect as modern machinery and material will permit. In the last eight years the designs of automobiles have greatly changed. Not only has the appearance of automobiles been changed, but every intricate part has been improved.

There are two types of changes made on automobiles—namely, seasonal and secular changes. Secular changes are those changes in styling which with a few variations each year, may be expected to require several years for completion of cycle. Seasonal changes are those changes in design which occur every season and they are expected to last only one season. To illustrate these two types of changes: an example of seasonal change is the mounting of running board independently of the fenders, while the secular change would be the complete elimination of running boards.

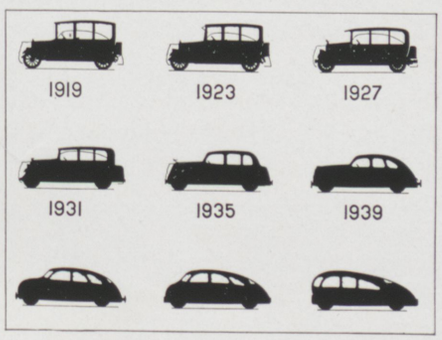
Since so many changes have been made on the late-model automobiles, it is best that the improvements of the engine, body, and chassis, the three main parts of an automobile, be discussed in the order mentioned.

Engine Design

The motor design of the 1940 automobiles has not changed appreciably from the engines of early model automobiles; however, many changes have been made on the engines, and these changes have made great improvements in engine performance. It has been made possible for a small and light engine to deliver greater horsepower than previous engines because of increased compression ratios, an improved fuel system, and a more efficient cooling system.

Improvements in the fuel system have been made by several manufacturers. With the adoption of a new carburetor silencer, a factor has arisen which tends to disturb the mixture ratio of the fuels. The rate at which the carburetor delivers fuel depends on the difference between the pressure in the carburetor throat and the float chamber. Ordinarily, the pressure in the float chamber is equal to atmospheric pressure. The pressure in the carburetor throat depends upon the resistance to air flow ahead of this point. When the silencer fills up with dust, the resistance to air flow is increased causing a decrease in pressure in the throat. This causes greater difference in pressure between the float chamber and the carburetor float which results in a rapid rate of fuel delivery and a richer mixture. One make of automobile vents the carburetor float chamber into the air cleaner, thereby eliminating the disturbing factor.

Courtesy SAE Journal



Evolution of the Family Bus

Improvements in pistons have been made by several manufacturers. Cadillac has widened the top land of its piston to move the top ring of the piston farther from the flame, thus reducing its tendency to gum. Most of the manufacturers are employing piston rings with oxidized wearing surfaces. These oxidized rings have anti-scoring properties, and with their adoption, the unit pressure of the ring on the cylinder wall has been increased. In some cases, springs have been placed under piston rings to reduce oil consumption. There has been a return to the use of cast iron pistons and cylinder heads. There are only three manufacturers using aluminum alloy pistons as regular equipment. Many manufacturers, however, supply aluminum pistons as extras.

To reduce wear of valve tappets in the valve-in-head engine, the contact surfaces of the tappets have been oxidized. In one case, steps were taken to reduce this wear at the contact surfaces of the valve gear by giving the surface of the tappet a finer finish and providing the ends with pushrods having spherical seats. Ford now employs valve-seat inserts for both inlets and exhausts in the V-85 and V-95 engines.

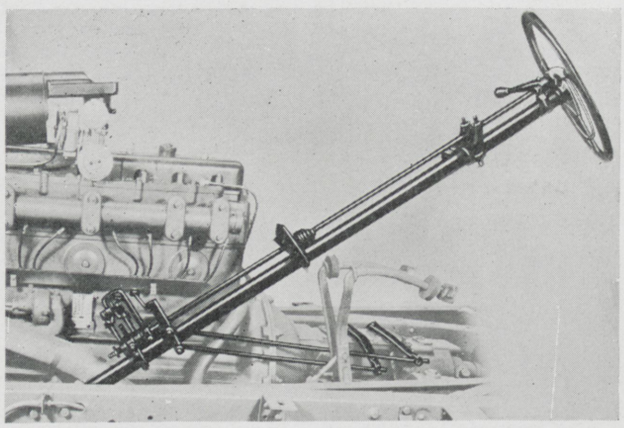
The size of the radiators remain approximately the same. It was not necessary to change the capacity of the radiators, because the newly de-

signed grill provided an adequate air supply. Full length water jackets are now employed which tend to reduce the temperature of the oil in the crankcase. Chrysler also has a water distributor cast in the cylinder block. In some cases, water is circulated directly around the exhaust valves to absorb heat.

One of the developments in the field of electrical equipment has been the voltage control of the battery. This new control is more expensive than the formerly universal third-brush control, but it has penetrated the low priced field. An advantage of this new type control is that the rate of charge increases as the state of charge of the battery is lowered. Ford cars are now equipped with an indicator which works on the principle of a voltmeter, but instead of showing actual voltages, it indicates whether the charge of the battery is high, low, or normal. This is a decided advantage, as without this indicator, it was possible to check the condition of the battery only with a hydrometer. Since radios, heaters, electric fans, and other things brought about increased electrical load, it was necessary to increase the capacity of the generators. To make it possible for the generators to carry this increased load without excessive heating, it was necessary to ventilate or air cool the generators.

Main developments in the clutch are the adoption of the disk-spring type, single-plate clutch, introduced by Chevrolet, and a wider adoption of an over-center spring as an aid in releasing the clutch. The over-center spring is a coiled tension spring which pulls the clutch mechanism in a direction opposite that of the regular clutch spring. When the clutch is engaged, the arm on the clutch pedal to which the spring is attached is in dead-center position, so that the over-center spring does not weaken the clutch spring. When the clutch is disengaged, the lever arm on which the new spring acts increases rapidly, and when the clutch is fully disengaged this spring neutralizes a considerable amount of force on the regular clutch spring; hence it requires much less effort to hold the clutch pedal in the disengaged position. In addition to this change, several manufacturers have made a larger clutch housing with ventilating openings in it to dissipate frictional heat.

Courtesy of Automotive Industries



The Steering Column Shift

A recent automotive development is Chrysler's new fluid flywheel, or fluid drive. This type of drive is said to give the gasoline automobile the same flexibility as that of a steam or electric vehicle. The two revolving elements of the fluid drive are known as the driver and runner. The driver is connected directly to the engine while the follower is connected to a shaft which transmits motion to the rear wheels by means of the transmission and differential gears. Power is transmitted from the driver to the follower through the medium of oil in motion. There is no mechanical connection between the driver and follower, and consequently, none between the engine and rear wheels. In ordinary driving at normal speeds, there exists about one percent slip between the driver and follower. A few of the advantages of the fluid drive are as follows: the fluid drive dampens all torsional vibrations of the engine, the car may be driven from a high to a very low speed without declutching, wear and tear on all driving parts are reduced, and on slippery roads it is much easier to avoid skidding with a car equipped with the fluid drive. The fluid drive is standard equipment on Chrysler's Custom Imperial.

In the features of 1940 cars new transmissions are mentioned, but in most cases the only changes are those necessitated by the change to the column-mounted shift lever. Gear shift levers mounted on the steering post are practically universal, either as standard or optional equipment. With the shift lever so located, it is possible to shift gears without moving the hands from the steering wheel. A new transmission, however, is employed by Studebaker this year. An outstanding feature of this transmission is the solenoid-controlled overdrive. Ordinarily, the overdrive will cut in at about thirty miles per hour, but the driver may change from overdrive to direct drive at any speed above this at will. Free wheeling continues on speeds below this range; however, if direct drive is desired, all that is necessary is the operation of a small dash control. The shift from overdrive to direct drive at speeds above thirty miles per hour may be accomplished by depressing the accelerator pedal beyond the wide-open throttle position. When the pedal is released from this position, the direct drive automatically cuts in. To change back to overdrive again is accomplished in exactly the same way. Thus, when the automobile is travel-

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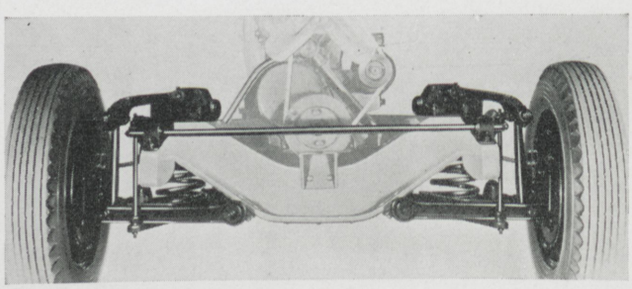
Courtesy of Automotive Industries



Coil-spring Eliminates Front Axle

Chemicals in War

by Edward J. Klecka

The First World War gave evidence of the effectiveness of certain gases in warfare. At present the subject of war gases is of interest. Mr. Klecka briefly considers the general classifications of harmful gases, and then discusses a large number of them, some under each classification.

CHEMICAL agents in warfare were first used on a large scale by the Germans in the World War. They were intended to break the deadlock that had resulted from the strength of the defense on the Western Front. Executed as a surprise or against persons unprepared and untrained to protect themselves, a gas attack is of deadly effectiveness, but the effects may be greatly reduced by efficient protective measures and equipment and by proper disciplining.

All protective measures are of a passive nature, and the first consideration should be given to a knowledge of chemical agents, their identification, and their physiological action.

A General Classification of Chemical Agents.

1. Lung Irritants—Agents which when breathed, cause inflamation and injury to the interior cavity of the bronchial tubes and the lungs.

2. Sternutators—Those substances which produce violent sneezing and coughing followed by temporary physical disability.

3. Lacrimators—Agents which cause a copious flow of tears and intense, though temporary, eye pains.

4. Vesicants—Agents which, absorbed or dissolved in any part of the human body, produce inflammation and burns with destruction of tissues.

5. Incendiaries—Agents which are dispersed in the air to provide tactical screening or to destroy materiel.

Lacrimatory Agents

Lacrimatory agents are formed by a central atom of carbon carrying a halogen and one or several negative groups in which the hydrogen atoms are readily displaced.

A. *Xylyl Bromide*
($C_6H_4CH_3CH_2Br$)

This gas was a German monopoly before the war, their plants being able to produce about 60 tons per month. It is important because it first showed the tactical importance of the gas shell. It is prepared by the direct bromination of xylene, is 8.5 times heavier than air, and has a pungent aromatic odor resembling lilacs.

B. *Bromacetone*
(CH_3COCH_2Br)

This compound was one of the most effective lacrimators used in the war. It is produced by the direct bromination of acetone. It was displaced toward the end of the war by brombenzylcyanide.

C. *Brombenzylcyanide*
($C_6H_5CHBrCN$)

Brombenzylcyanide was the last and most used lacrimator in the World War. Industrially it was prepared in three steps, as follows: (1) chlorination of toluene to form benzylchloride; (2) the conversion of benzylchloride to benzylcyanide by the action of sodium cyanide in alcoholic solution; (3) the bromination of the benzylcyanide with bromine vapor in the presence of sunlight.

Protective measures by R.O.T.C. members

D. *Chloracetophenone*
($C_6H_5COCH_2Cl$)

This gas was not used in the World War, but after the war American investigators worked out a satisfactory process of manufacture. It is made by chlorination of acetic acid with sulfur monochloride and chlorine and then treated with benzene in the presence of anhydrous aluminum chloride. Aside from its combat use, this substance is excellently suited for use as a training gas and for suppressing mobs and internal disorders.

Lung Irritant Agents

A. *Chlorine* (Cl_2)

Chlorine, the first gas used in the war, is a greenish-yellow gas made from common salt by electrolysis. It was used mainly in cloud gas attacks. Its chief disadvantage lies in the fact that it possesses great chemical activity which makes it easy to protect against. Thus, there is little likelihood that chlorine will figure as a chemical agent in any future war between first-class powers.

B. *Phosgene* ($COCl_2$)

Phosgene consists of chlorine combined with carbon monoxide. These two poisonous gases, when mixed together, will not readily unite, but if a ray of sunlight falls upon the mixture they combine at once. It is produced in connection with the manufacture of dyes.

Aside from its characteristic odor, phosgene may also be detected in the field by its so-called 'tobacco reaction', by which is meant that men who have breathed only very slight amounts of phosgene experience a peculiar flat metallic taste when smoking tobacco.

Smoking Prohibited

C. *Chlorpicrin* (CCl_3NO_2)

Chlorpicrin is a liquid and is commonly loaded in a shell or bomb with 20 per cent of tin chloride, which produces dense white fumes that penetrate gas masks. It is made by the treatment of picric acid with chlorine. Chlorpicrin appears to have been the most widely used combat gas in the war.

Systemic Toxic Agents

(Irritant)

Systemic toxic agents pass into the blood stream without local damage and are diffused throughout the whole interior of the body and exercise a general systemic poisoning action which finally results in death from paralysis of the central nervous system.

A. *Hydrocyanic Acid* (HCN)

Hydrocyanic acid gas is one of the most virulent poisons known. It is derived by distilling a concentrated solution of potassium cyanide with dilute sulfuric acid and absorption of the vapors in water. The French used this gas to a great extent but its extreme volatility and the fact that its vapors are lighter than air greatly decreased its effectiveness.

Vesicant Agents

The term vesicant agents denotes those compounds which blister the human and animal body surfaces, either exterior or interior, with which they come in contact. Most of them are highly toxic and nearly all produce multiple physiological effects.

A. *Dichlorethyl Sulfide*

($S(Ch_2Ch_2)_2Cl_2$)

This is the chemical known as mustard gas. It is the almost perfect battle gas, since there is a total absence of any means of protecting the body against it, even though the mask furnishes adequate protection for the lungs. "Pound for pound it produced nearly eight times the number of casualities produced by all the other battle gases combined."

Mustard gas was made by two radically different processes during the war. The German process was as follows: (1) Alcohol was split into ethylene by passing its vapors over aluminum oxide at 300°C; (2) the ethylene gas was pumped into large reactors containing chloride of lime paste which was carefully cooled during the process; (3) the resulting ethylene chlorhydrin was forced out of the lime paste by steam; (4) the ethylene chlorhydrin was converted into throdiglycal by sodium sulfide; (5) the throdiglycal was chlorinated by treatment with gaseous hydrochloric acid to the "mustard gas." The Allies prepared it by the direct action of ethylene gas on sulfur monochloride.

All in all, mustard gas is one of the most effective chemical agents yet to make its appearance.

B. *Chlorvinyldichlorarsine*

"Lewisite" ($CHClCHAsCl_2$)

Chlorvinyldichlorarsine is America's principal contribution to the materia chemica of the World War. It was first prepared in 1917 by Dr. W. Lee Lewis in an effort to create a compound that would combine the vesicant action of mustard gas with the systemic poisoning effect of arsenic. Dr. Lewis of Northwestern University manufactured it at the rate of ten tons per day. It is produced by the action of acetylene on arsenic trichloride in the presence of aluminum trichloride acting as a catalyst.

The manufacture of Lewisite met with serious technical difficulties and no Lewisite was actually used in France. The use of Lewisite is dependent to a great extent upon meterological conditions so that its future in the next war is uncertain.

There is a strong possibility that vesicants will be dispersed in the future by airplane sprays and bombs. Vesicants are the most important agents in warfare and will continue to hold that position until protective clothing can be devised.

Respiratory Irritant Agents

(Sternutators)

By the summer of 1917, the gas masks of all of the belligerents had been developed to a stage where they furnished adequate protection against the lung-injurant gases. The problem was, therefore, to find a quick-acting nonpersistent gas that would penetrate the mask, and the respiratory irritants were the solution of the German chemists to this problem. While the respiratory irritants produced few serious casualties, by quickly penetrating the mask, nauseating the soldiers and causing frequent vomiting, they usually made it impossible to wear the mask, and upon its removal the soldier soon fell a victim to the lung-injurant agents which were fired simultaneously with the respiratory-irritant agents.

A. *Diphenylchlorarsine*

($(C_6H_5)_2AsCl$)

Diphenylchlorarsine was introduced simultaneously with mustard gas by the Germans as an offensive companion thereto, its purpose being to penetrate the Allies' masks, which successfully protected against all the lung injurant agents. This was accomplished by dispersing the chemical substance in the form of a dust which, not being a vapor or gas, was not absorbed by the charcoal and soda lime in the gas-mask canister.

This agent is prepared in the following manner: (1) Driphenylarsine is formed by acting on chlorbenzene and arsenic trichloride with sodium; (2) the triphenylarsine is then heated under pressure with more arsenic trichloride and diphen-

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HERMAN A. MOENCH — HENRY C. GRAY

Here Comes Whizzer Now

The American secretary for the Rhodes Scholarship Committee has just announced the suspension of this magnificent philanthropy. The bulletin continued by stating that 1937 and 1938 scholars will be sent home and that 1939 awards have been cancelled.

The endowment gets its name, as does the African province of Rhodesia, from Sir Cecil John Rhodes, British statesman and Kimberly diamond mine owner, who died in 1902. In his will he left about $10,000,000 to found the three-year scholarships tenable at Oxford University. The income for each scholarship was $1,500 a year, and two were set apart for every State and Territory in the American Union and for every English speaking colony. *Five were set apart for students of German descent.*

We wonder if our English friends, realizing the wisdom in the words of Maria Remarque, who wrote, "In difficult times simplicity is the most priceless gift—a magic cloak that conceals dangers into which the super-intelligent run headlong as if hypnotized . . . Knowledge maketh free—but unhappy," have sent the last named five students home.

Co-operation

The Rose student council received a graceful note of apology from the student council of Indiana State Teachers College recently in explanation of a minor violation of the pact entered into by the two schools last year. The infraction centered around an abortive attempt to take Rosie for a ride.

This in no way affects the peaceful relations maintained between the general groups of students, and if necessary, effective measures will be taken by the responsible elements of both colleges to restrain a few anti-socials from the perpetration of misdemeanors.

Gridirony

Those posters upon which are printed our football schedule are very fine indeed. But somebody slipped when the accompanying illustration was designed or, more specifically, colored. The objection lies in the fact that they gave the blue team the ball. However, the player in the red jersey is making a beautiful tackle.

While the subject of tackling is at hand though, let's tackle the job of cheering for our team with more coordination. The volume was great, but it is possible that our synchronous shortcomings might someday be communicated to the team with disastrous results. So, for the sheer satisfaction of getting off a few timely huzzahs, let's follow the metronome more closely. We do have an excellent cheer leader.

Smilantics

If America is going on the rocks, as some of our darkest pessimists claim, it is doing so in an increasingly comfortable, helpful manner. Some of industry's most recent contributions to what the pessimists term "our crumbling civilization" are:

A device in the shape of a fruit jar which can generate enough steam in a few minutes to sterilize a rack of soda fountain dishes, heat a barber towel or accomplish any one of thousands of similar jobs where steam in small amounts is needed right now. The Reds should have had one of these for the series.

An electric secretary about the size and weight of a typewriter which takes dictation, answers the phone, and receives callers' messages. Laplanders have protested.

A new alloy — cupaloy — long sought in the industrial laboratory. It's nearly pure copper with the strength of steel.

An office dupligraph which in a single operation prints a letter, the name of the person to whom it is being sent, and a personal salutation at the rate of 800 words an hour. Loc. sit.

Glareless lights, used with great success in illuminating Shibe park

(*Please turn to Page* 10)

From The President's Pen

With the opening of the college year 1939-40 Rose Polytechnic Institute inaugurates a course of flight and ground school instruction as part of the national program of the Civil Aeronautics Authority. This program is planned to train 11,000 college students this year as civilian pilots, and Rose secured approval from Washington to participate in the work because of three major facts. First, Rose courses are accredited. Second, Prof. Wischmeyer has given a course in aerodynamics for many years as part of the required curriculum for mechanical engineering students; and third, at the Paul Cox Field we have available excellent personnel and facilities for flight instruction.

Regulations of the Civil Aeronautics Authority limit instruction to college students between the ages of eighteen and twenty-five and recommend non-admission of freshmen. The latter condition is entirely reasonable because of the technical nature of the ground course. Each student must have the written permission of his parents, must pass a physical examination given by the resident Authority flight-surgeon, must have a satisfactory scholastic record and must pay a fee of $30.00 to cover physical examinations and insurance. Cost of ground and flight instruction, including the use of airplanes, is paid by the Government.

The ground course is entirely technical and covers such subjects as aerodynamics, navigation, meteorology, engines, etc. Seventy-two hours of instruction are prescribed and the course must be completed by February 1, 1940. At Rose the course will be given by Prof. Wischmeyer as a four-credit subject during the first semester. Two credits of regular required work may be omitted and the pilot training will cover this and provide two additional elective credits.

The flight course will be given under the direction of Mr. O. W. Jones, Field Superintendent at Paul Cox Field. Mr. Jones will have two assistants, one of whom will be K. L. Buis, Rose '38. Under the Authority's rules each flight instructor is limited to ten students, and each student must receive from 35 to 50 hours of individual flight instruction.

At the present time the quota assigned to Rose has not been announced by the Authority, but the available qualified flight instructors fix the maximum at thirty students.

Preliminary applications were received from thirty-five students but scholastic and physical requirements will reduce this number considerably.

The purpose of the pilot training program is to materially increase the number of civilian pilots in the United States and the course will not include combat tactics or formation flying. The Civil Aeronautics Authority has planned a five year program and it is expected that next year and thereafter, 20,000 pilots will be trained annually.

D. B. Prentice

EDITORIALS

(*Continued from Page* 9)

in Philadelphia. Their use in business, industry, and household is indicated.

Chip steaks, though not an invention of industry, are a contribution from a California butcher shop. They are scientifically tenderized steaks, a boon to the men and women who crave a juicy sirloin but do not trust their dentures. This will take the stake out of steak.

And so it goes. America marches ahead while its pessimists moan that the end is not far off.

Did you know that?

Ancient beliefs that the moon emits invisible rays which affect men were revived in a practical form by a study of the moon and the fluctuation in strength of radio broadcasts at night.

Dr. Harlan T. Stetson of Massachusetts Institute of Technology reported on 20,000 measurements of radio broadcast signals in connection with the phases of the moon. He found that the radio signals rise slightly in strength from the time of the new moon to within three days of full moon. There were other seemingly regular fluctuations with changes in the moon.

It will take more data, Dr. Stetson said, to prove whether the moon has anything to do with radio changes, but he said a possible explanation would be rays emitted by the moon itself, due to the intense ultra-violet light of the sun, which strikes the lunar surface with full force because the moon has no air to protect itself.

Declining income from endowments and other sources is placing a greater share of higher education's cost on students through increased fees according to a report made by Trevor Arnett, retiring president of the General Education Board in Chicago and a trustee of the University of Chicago.

Mr. Arnett points out that, despite increases in costs to students, total incomes of most private schools are still under the 1927 level, leaving a gap which has brought a drive to enroll more students.

Covering forty-seven state institutions, thirty-nine private universities and 107 private colleges, the report shows state institutions have increased fees 20.6 per cent in ten years ending in 1937, endowed universities have increased fees 10.9 per cent, and endowed colleges 11.8 per cent.

Research and Development

by Hulit E. Madinger, ch., '42

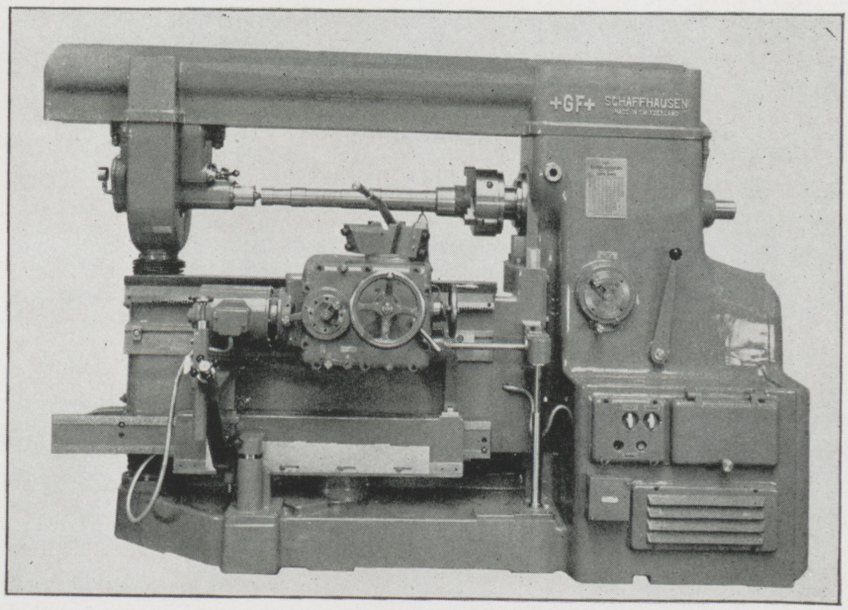
While the public sale of television sets started only on May 1 in the United States, they have been available for 2½ years in England. About 5,000 sets were sold there in the first two years, at prices ranging from $450 to $700, but current sales are running at a much better rate.

The cheapest sets in this country are priced at less than $200, but these are for sight reception only and do not include sound. American manufacturers of television equipment are fairly well satisfied with the results of their campaign to date. The public has shown a good deal of interest, although not many sets have actually been sold.

Apart from the expense of the sets and their installation, the chief item of sales resistance is the belief of prospective customers that current models will soon be rendered obsolete by technical improvements. Insiders privately concede that this is probably true. Philco's new "iron trap," for instance, designed to eliminate the blur that is frequently found in television reception, will compel other manufacturers to incorporate similar devices if it works as well in practical use as it has in the laboratory. Experts agree that the industry is in the same groping stage as radio was about 15 years ago.

Hydro-Copying

A hydraulically-operated duplicating lathe of radical design has recently been introduced into this country by W. A. Schuyler of New York City. The machine is built by the Machine Tool Division, Fischer Steel Works, Schaffhausen, Switzerland. The cutting tool is controlled through a hydraulic system by means of a sheet steel templet. The arrangement of the various elements of this lathe departs radically from convention. The headstock of this lathe is placed at the right, and the tailstock is suspended from an overhanging arm. The cutting tool is mounted below the work. The spindle of this lathe moves in a direction counter to that of the conventional lathe. This throws the chips to the rear of the lathe where a sloping apron permits convenient disposal.



Cut courtesy Electronics

Hydraulically-operated Lathe

The toolholder and spindle are rigidly held in a closed frame made up of the base, column, overarm, and outside cylindrical support. The manufacturer claims that this permits the best performance to be obtained from carbide-tipped tools. The turret head of the tool holder holds three tools. This tool holder is mounted on a knee the height of which, and hence the infeed of the tool, is controlled by a micrometer scaled handwheel. The position of the tool is automatically controlled from the templet. A separate motor drives a rack and pinion which provides the longitudinal feed. The tailstock is provided with a hydraulically controlled live center.

The roller-bearing spindle is driven by an 18-hp motor. A multiple-disc clutch and V-belt drive is used. The motor, which is push-button controlled, is mounted on a hinged base in the column. A 3-hp motor drives the gear pump which provides the pressure for the hydraulic mechanism. The lathe has the following specifications: Maximum work diameter, 11¾ in.; maximum swing, 18¼ in. diameter; maximum length between centers, 39⅜ in.; vertical travel of tool, 5⅞ in.; longitudinal travel of carriage, 38⅛ in.; number of spindle speeds, 8; range of spindle speeds, 70-1,200 r.p.m.; number of automatic longitudinal feeds, 16; range of automatic longitudinal feeds, 13/16-20½ in. per minute. The net weight of the lathe including the electrical drive is 7,260 pounds.

New Heat Resisting Glass

The Corning Glass Works has announced a new process for the production of a heat resisting glass of thermal expansion so low that it approaches that of fused silica. A vessel or object made of this new material may be brought to a red heat and then plunged into ice water without breakage. This is considerably better than can be expected of the best

previously developed low expansion glasses. A striking demonstration was given of the properties of this glass when Dr. Nordberg, one of the developers of the material, poured a ladle of molten iron on a piece of the glass which was resting upon a cake of ice. The manufacturer points out, however, that it will require fully two years for completion of commercial development. The product is now in the pilot plant stage. It is obvious, though, that there will be many applications for this glass never before possible with previous grades.

Ordinary methods of glass working such as molding, blowing, and pressing may be used in forming glassware of this material. There is a considerable change in the composition of the glass due to the treatment subsequent to the forming. The treatment results in a linear shrinkage of thirteen per cent and a volume shrinkage of thirty-five per cent. The object is first formed from certain borosilicate glasses. These glasses are somewhat unstable. Separation of the glass into two phases is accomplished by a heat treatment. One of these phases is high in silica and the other very low in silica. This second phase is soluble in some of the common acids. This acid soluble phase is then removed by leaching with such an acid as dilute nitric. A skeleton structure is left which contains about ninety-six per cent silica. A rough, but not porous, surface is left on the object after this treatment. It now contains, however, thirty-six per cent voids. The material is then fired at a vitrifying temperature. This condenses the structure and produces the clear solid object having the remarkable properties pointed out. It is during this last step of the process that the thirteen per cent linear shrinkage occurs.

It will be noticed from the description of the process that it will enable plant production at a cost relatively low to that of fused silica. It is of great advantage that the glassware is formed at the low melting temperature of the original glass and not at the high temperature required by fused silica. The patent for this process has been issued to H. P. Hood and M. E. Nordberg of the Corning research laboratories and is assigned to that company.

Courtesy Chem. & Met.

Dr. Nordberg, one of the patentees of Corning's new low expansion glass, demonstrates with a ladle of molten iron and a cake of ice.

Mobile's Subaqueous Vehicular Tunnel

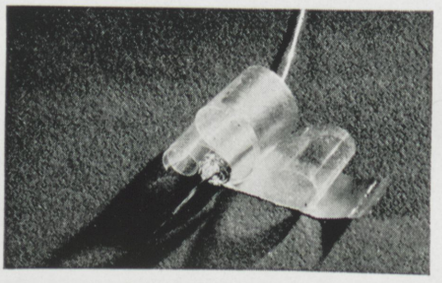
A new vehicular tunnel is being built at Mobile, Alabama. This four million dollar tunnel will be located on U. S. Route 31. The tube will eliminate a detour of eight miles on the city's main approach from the north. The single tube of the tunnel is to be laid in a trench the bottom of which attains a maximum depth of eighty feet below the level of the river at low tide. About a million cubic yards of mud is to be dredged from the river.

The tube is fabricated of steel in drydock by the Alabama Drydock and Shipbuilding Company of Mobile. The tube is octangular with welded-in-place reinforcements for the concrete. The interior of the 30-foot tube is lined with concrete. As the sections are completed the ends are sealed and the sections launched. They are then floated into position over the trench and sunk. Over the tube will be placed a blanket of tremie concrete two to three feet thick. This method of construction will be used for 2,100 feet of the tunnel. This includes five-hundred feet on each shore, which will be floated into position by the use of wet coffer dams. The length of the finished tunnel including the approaches will be 3,445 feet. The contract for the main tube and approaches is held by the Arundel Corporation of Baltimore.

Polystrene Film

A newly developed polystrene film for electrical insulation purposes has been announced by the Bakelite Corporation of New York. This film embodies the advantages found in the properties of polystrene molding material. The film has been developed especially for use in wound capacitors in radio sets and other types of electrical equipment. It has a low power factor which makes for extremely efficient capacitors. The polystrene film is such that the electrical properties remain constant at varying conditions of temperature. In the construction of capacitors it is important that they have stable capacitance at various temperatures and also for various frequencies. This particular film is suitable because of the stable characteristics of polystrene and its exceptional water resistance. The film is made in a clear grade and one tinted a shade of purplish black. It is wound on spools of four inch diameter in

Cut courtesy Electronics



The Film

widths of one and one half and two and one half inches. Although other thicknesses are available, the standard thickness is one mil.

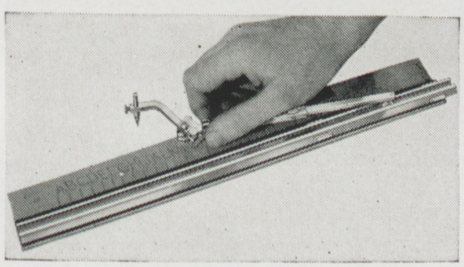
New In Air Conditioning

In large size air conditioning systems the trend seems to be away from the conventional wound rotor motors and toward the synchronous type. A new system has been in-

stalled at the International Building, Rockefeller Center, New York City, utilizing such a motor. This particular motor is a 1,000-hp, 1,200-r.p.m., 100-per-cent-power-factor Westinghouse synchronous motor. It drives a 4,300-r.p.m. Carrier centrifugal compressor which supplies 800 tons of conditioned air to the International, the Associated Press, and the Time and Life buildings. The motor is more efficient and less expensive than a wound-rotor type unit. The power-factor feature of this system will take on added value when other contemplated units are added.

The motor is the largest known of its type supplied from city power networks. The power is supplied by two 1,000-kva, three-phase, 13,800-208-volt transformer banks interconnected in parallel. Connection is made through an associated control and a circuit breaker.

The motor is brought up to full speed within twenty-five seconds without causing any noticeable flicker on the network system. The current inrush on the last step is about 8,000 amperes. The full load current is 2,160 amperes. If the motor were thrown directly across the line with a locked rotor, a current of 9,500 amperes would be drawn. A 2,500-ampere air circuit breaker, however, protects the motor.



Speedy Lettering

A power factor meter is used with the motor which operates two contacts. At 95% power factor a klaxon is sounded to attract the engineer's attention. The motor is cut off if the power factor drops to 65%. This motor proves to be very quiet, also. It has been tested at 83½ decibels. This can be compared with 62 for conversation and 72 for a typewriter. The consulting engineer was Clyde R. Place.

Lettering Aid

A fast, accurate, versatile and economical lettering set is announced by the Dietzgen Company, Chicago, Illinois. With one single guide it is possible to produce eight different types of lettering simply by changing the setting of the tracer and the pen arm. Each lettering outfit has six different weights of pen points from extra light to extra bold, thus making 48 different weights and styles of type available. Letters are formed in one continous movement without shifting the guide, because each character on the guide is complete and in alphabetical order. Each guide has upper and lower case letters, numerals and characters. Proper positioning and spacing of letters are made easy by the spacing markers. The guide is precision-built of special, durable plastic material.

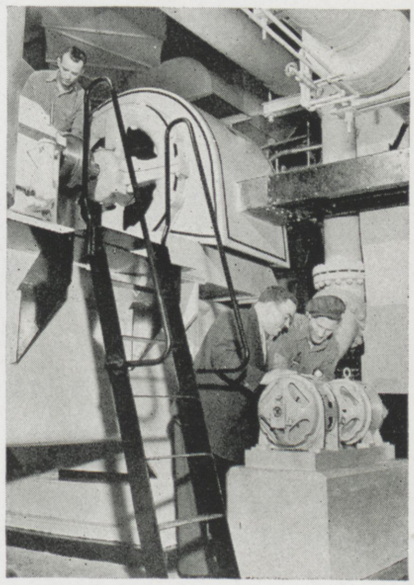
Did You Know That?

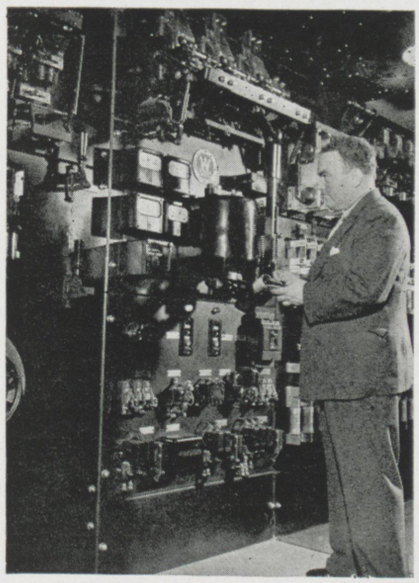
The Boulder Dam power plant, with seven generators in operation, is now the largest in the world, Reclamation Commissioner John C. Page reported to Secretary Ickes.

Page said the seventh generator, rushed to completion last June to fill a critical need in the system of the Southern California Edison Company, brought the plant's capacity to 860,000 horsepower, compared with 746,000 horsepower in the Dnieprostroy plant in Russia, previously the largest.

Ultimate capacity of the Boulder Dam plant is 1,835,000 horsepower.

Cuts courtesy of Chem. & Met.





Large synchronous motor used on city network for air-conditioning system. Auxiliary motor-generator set used for d.c. excitation of the 1,000-hp. synchronous unit is shown at the left: in the upper right of this view may be seen the busbar feed leading from the control. Main control panel for the unit is shown at the right.

The firefly is a skywriter, who always writes the same letter, a shallow, lopsided U, when he flashes. This uniform pattern was discovered by Prof. Charles T. Knipp of the University of Illinois. He studied the flies in a 10-acre field in Ohio.

Just before a fly flashes he slows his flight. As the flash begins he drops toward the ground. Then his speed increases and he finishes the flash on a rise, and the rise takes him higher than when he lighted up. As he finishes the flash he slows up again, wobbles a bit, but does not drop.

The reason for the particular and peculiar motion, Professor Knipp suggested, was the extra energy used to flash. The fly's power drops momentarily when he turns on the light, then flows more strongly during the glow. *N. S.*

Great Men of Science

by Nicholas Smilanic, e., '40

Reading time, 5 minutes

Editor's Note: A completely scientific attitude is essential to the successful prosecution of an engineering education. The development of the scientific attitude is hastened by a familiarity with the problems which confronted the immortals of our textbooks and with the manner in which they resolved these problems. The Contributing Editor will, in this and succeeding issues, make easily available condensed accounts of the lives of the world's great scientists.

Galileo Galilei—1564-1642

First among the masters of science and invention to catch the true spirit of modern research was the Italian, Galileo Galilei. The supreme purpose of his life was to discover the truth about Nature and her laws. He cared nothing about theory which could not be demonstrated by experiment and observation. Thus, when little more than a youth, he disproved, from the Leaning Tower of Pisa, Aristotle's century-old myth concerning the time of a falling body.

Galileo was born in Pisa in 1564, and educated in the university of his native city, succeeding to professorships in his alma mater and later at Padua and Florence. While working at these universities, this Italian scientist loosed the fetters that bound the thinking of his fellowmen to Aristotle and the traditional past. Even as a student, his hatred of the false, and his yearning for the truth brought him in frequent conflict with his professors and the student body. His demand that the principles of natural philosophy correspond with the facts of observation led him repeatedly to challenge the authority of the past. Thus he brought upon himself unpopularity and the title of "wrangler." Here was the first apostle of the modern laboratory method, and as usually is the case, with men of new ideas, the world did not look upon him kindly. He disturbed men's comfort. He upset their century-old beliefs. To Galileo a thing was not true simply because it seemed plausible. With him it must bear the test of rigid demonstration.

Aristotle had taught that a body weighing one hundred pounds would fall one hundred times as fast as a body weighing one pound. No one had thought to challenge this statement. Aristotle had said so and that was enough. But every school-boy knows how Galileo, dropping a half-pound weight and a hundred pound cannon-ball from the leaning tower of Pisa, proved the utter falsity of this contention. Would you not suppose that this striking demonstration of the truth would have brought fame and approval to Galileo? It did not. Reverence for Aristotle and the past was stronger than the desire to know the truth. The students and the professors of the university accused him of being a magician, and so unpopular did Galileo become that he was compelled to flee from his native city. He took refuge in Padua where he obtained a professorship in the university. His fame as a lecturer soon spread and brought to him students from every part of Europe.

It was in the field of astronomy that Galileo did his greatest work. He early became a disciple of Kepler and a convert of the new theory of the heavens. About 1610 he learned of the newly-invented "Dutch telescope," a contrivance by which it was reported distant objects could be made to appear much larger and nearer. In a moment of inspiration it occurred to this philosopher of Padua that this instrument might reveal the mysteries of the stars. He built an instrument which magnified objects nearly a thousand times and brought them thirty times nearer.

With it Galileo swept the heavens, and in doing so expanded the tiny world of the ancients to a universe of vast extent. Contrary to the common belief of that time, the stars were not all equidistant from the earth. With his first glimpse of the starry depths, the imaginary celestial sphere of his predecessors vanished. Turning his "optic tube" upon the beautiful Milky Way, Galileo resolved this hazy band of mellow lights into myriads of faint stars at such stupendous distances as to be indistinguishable without optical aid. Venus was seen to pass through phases similar to those of our moon. Thus did he obtain convincing proof that the planets, unlike the stars, are dark bodies shining by reflected sunlight. Our own moon, the most beautiful object of the heavens, disclosed a surface scarred by rugged mountain ranges and pitted with volcanic craters. Disquieting, indeed, was this discovery to the Aristotelian idea, which held moon and planets to be perfectly smooth bodies.

A still greater discovery remained. One evening, as Galileo pointed his telescope toward the planet Jupiter, he brought to view a miniature solar system. Here was a huge planet and near by were four tiny "stars." Galileo watched these "stars" and learned that they circled about the planet, exactly as our moon circles about the earth. Did not the planets revolve about the sun, just as these moons revolve about Jupiter? The phases of Venus had proved this to be true for one planet, and now the last lingering doubt as to the motion of the others disappeared from Galileo's mind.

Not content with these explorations of the night time, Galileo turned his attention to the sun itself. His observation was rewarded by the detection of a dark spot, a seeming blemish, upon the surface of that giant luminary. He noticed that it changed shape, suggesting changes in the substance of the sun itself. Continued observation showed that the spot returned after a period of twenty-four days, thus proving that

(*Please turn to Page* 22)

Here's the set-up back of the familiar blue Bell emblem—

1. American Telephone and Telegraph Company, which coordinates system activities—advises on telephone operation — searches for improved methods.
2. 24 associated operating companies, which provide telephone service in their respective territories.
3. Long Lines Department of A. T. & T., which interconnects the operating companies and handles Long Distance and overseas telephone service.
4. Bell Telephone Laboratories, which carries on scientific research and development for the system.
5. Western Electric, which is the manufacturing and distributing unit of the Bell System.

With common policies and ideals, these Bell System companies all work as one to give you the finest and friendliest telephone service — at lowest cost.

Around The Campus

with Earl F. Michaels, e., '42

Dr. Edwin Mann Dead

Great sorrow and deep regret accompany the news that Dr. Edwin Wade Mann has died—great sorrow among his fellow faculty members upon the loss of a fine friend and an active associate and deep regret among his students upon the loss of a fine friend and a professor who was unexcelled in the giving of his time to the student welfare. He had unselfishly served Rose for nine years.

Dr. Mann had spent the summer in Columbus, Ohio, his birthplace, attending Ohio State University, where he completed work on his doctor's degree. Just before school opened he underwent an operation at the Mayo Clinic, Rochester, Minnesota, and had recovered sufficiently to appear at Rose once more before he died. On October 2 he suffered a heart attack and succumbed at Union Hospital.

In addition to being assistant professor of chemistry, he was a member of the Rose chapter of the Society for the Promotion of Engineering Education, past president of the chapter of the American Association of University Professors, charter member of the chapter of the American Institute of Chemical Engineers, and the Alpha Chi Sigma and Sigma Xi fraternities. He was also an outstanding figure in the success of the biennial Rose Show, and he will be most sorely missed when show time comes around this spring.

New Faculty Members

DR. ODON S. KNIGHT

A native of Denver, Dr. Knight attended the University of Colorado and was graduated with special honors from the Chemical Engineering Department in 1928. He earned the Master of Science Degree in 1932 and after additional graduate work at the University of Michigan received the Doctor of Philosophy Degree in 1933. He also has a Chemical Engineer Degree granted at Colorado in 1935.

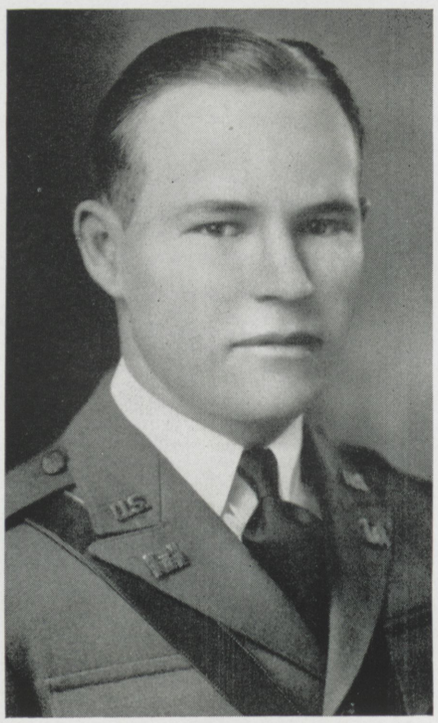
Dr. Knight has been employed at the Ewart Works, Indianapolis, of the Link-Belt Company as engineer and research chemist. In the latter position he was engaged in the development of inexpensive process coating for malleable iron products with chromium. During seven years of teaching at the University of Colorado he was instructor and later assistant professor of chemical engineering. He resigned this position to take charge of chemical engineering design and development at the J. P. Devine Company.

Dr. Knight is a member of Tau Beta Pi, Sigma Xi, and Theta Xi fraternities, the American Institute of Chemical Engineers, Alpha Chi Sigma, and the American Chemical Society.

LIEUTENANT JAMES V. HAGAN

James V. Hagan, 1st Lieutenant, C.E., U. S. Army, is beginning his first year as instructor in the Department of Military Science and Tactics at Rose, filling the post left vacant when Captain Donald C. Hawkins was transferred to rivers and harbors duty at Omaha, Nebraska. Lieutenant Hagan came to Rose after spending the summer on the executive staff at Camp Perry, Ohio, where the national rifle matches are held.

The Lieutenant began his college education at Western Kentucky State Teachers College, Bowling Green, Kentucky, and was graduated in 1928. The following four years he spent at West Point Military Academy, later entering the Corps of Engineers. In 1936 after two years work at Princeton University, the degree, Master of Science in Civil Engineering was conferred upon him. He also attended the engineers' school at Fort Belvoir, Virginia.



Lieutenant Hagan

Until this summer he was active in the U. S. Waterways Experiment Station on the Lower Mississippi, working on interesting engineering problems and gaining valuable experience during the peak flood conditions in 1937.

Registration

After the smoke had cleared away on registration day, the following statistics were gathered by your besmirched reporter regarding enrollment in the upper classes:

	Chemical	*Civil*	*Electrical*	*Mechanical*	*Total*
Sophomores	20	10	14	31	75
Juniors	11	5	13	21	50
Seniors	9	6	9	11	35

According to the latest reports, the percentages of the upperclassmen in the various departments are as here tabulated:

Chemical—25%.
Civil—13%.
Electrical—22%.
Mechanical—40%.

The freshman enrollment totaled 100, and if the freshman-sophomore battle was any indication at all, this 100 contains at least a lot of good football material.

Improvements

To those who had been previously acquainted with Rose, the school presented a somewhat different appearance on registration day. Much painting had been done, the civil department had added a constant-head tank for the hydraulic laboratory, and a new transmission line had been completed in the Physics department. In addition to this, the shop department had undergone a remodeling in the moving upstairs of the foundry with the addition of a gas furnace. The former change was consummated in order to make room for a new industrial laboratory for the chemical department.

Smoker

The Blue Key smoker was held at Deming Hall Wednesday evening, September 13, for the freshmen, in order to give them a conception of the extra-curricular activities offered at Rose and to afford them a good start in making those friendships which abound at Rose.

The session was presided over by J. Edward Taylor, member of Blue Key, who first introduced the faculty so that the freshmen might meet the men who are to guide them through their four years at Rose. Leading members of the different organizations then gave the freshmen an insight into the specific activities. The speakers and their subjects were: Frank Pearce, Tau Beta Pi and the student council; Allen T. Wilson, Tau Nu Tau; Milton Hosack, Dormitory Association and professional societies; Maurice W. Cannon, *Modulus* and Camera Club; Maurice C. Fleming, Glee Club and Rifle Club; Charles Howlett, *Technic* and Handbook; Robert D. Phelps, Debate Club and Honor Club; and Joseph Dreher, sports.

After the talks, a marshmallow-eating contest was held, with Bill Kahn and Harold Schwartz getting plenty to eat. Also, an ice debate was held in which Ralph Brown and Jack Winningham received cold hands instead of hot feet.

Coach Phil Brown was then introduced and showed motion pictures of activities around the campus, including football. He also urged all freshmen, who possibly could, to come out for football.

The meeting closed with the highlight of the evening—refreshments.

New Transmission Line

Under the direction of Dr. B. A. Howlett there was completed during the summer a new artificial transmission line to be used for measurements in the high frequency laboratory work. The transmission line consists of 24 T-sections mounted on a special portable rack and arranged with binding posts between each pair of sections for convenience in taking voltage and current readings. Each section, equivalent to 7.88 miles of 104-mil open-wire line, consists of two accurately matched coils, a resistor, and a condenser.

The coils were constructed at Rose by M. Johns, e., '40 and L. Nelson, e., '41, as an N. Y. A. project. The condensers were gifts of the Western Electric Company.

It is expected that this new equipment will broaden considerably the field of laboratory work associated with the transmission line theoretical work. The line will also be available for special problems arising in thesis investigations.

Rose Rating in Nation-Wide Chemistry Test

The American Council on Education chemistry test was again presented at Rose in 1939. In the past three years it has been used as the final examination in freshman chemistry.

This year over 10,000 students throughout the country received this test, and the Rose rating was almost parallel with the average throughout the country. Of the 83 men taking the test at Rose, Ira Scudder was the highest, being close to the top in the nation-wide rating. It is gratifying to know that Rose men still rank among the leaders in the country.

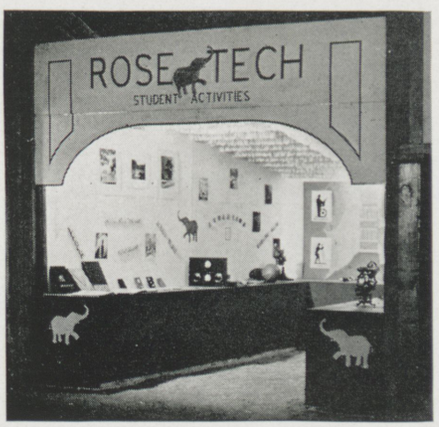


Photo by White
College Booth at Vigo County Fair in August, operated by Malcolm Steele, '39, and Joseph Dreher, e., '41.

War News—Not European

Thursday morning, September 14, found the sophomores and freshmen mustering their sides for the annual freshman-sophomore battle. At the zero hour of eleven o'clock, the contestants and spectators gathered around Lake Deming, the scene of the battle.

The first contests of the day were the wrestling matches composed of three divisions: the light-weight, under 150 lbs.; middle-weight, under 175 lbs.; and heavy-weight, which covers everything from 175 up. The first bout, the light-weight division, found Jim "Palpitating" Poole, freshman entrant, matched against John Cundiff, representing the

sophomores. After the contestants had sized each other up, Cundiff took the offensive and quickly pinned Poole, putting the sophomores in the lead. The sophomores increased this lead by winning the middle-weight division when Moore pinned Procopo in a furious and fast scrap. The heavy-weight division produced a slow but interesting bout which went into an overtime, but finally ended in a draw. The class of '43 pinned their hopes on 228 lb. Bill Kahn, who succeeded in putting the sophomore entrant, Ed Martin, on his back, but the effort was to no avail because they were out of the ring. The skirmish ended with both men retaining their prestige but without victory.

The tub races were next on the program with the two classes choosing their lightest men in order not to exceed the limited weight which the none-too-buoyant tubs required. The experienced Jimmy Osman succeeded in taking the first race for the sophomores from Bill Beede.

The freshmen finally broke into the win column when Bob Johnson paddled his way to victory over Bill Worley. A sophomore delegation promptly met Bob on the bank and gave him the honor of being the first freshman to enter the lake against his wishes. The latter affair almost precipitated a catastrophe when the irritated freshmen, not liking the idea of their brother being drenched, went to his rescue. Before Coach Phil Brown quelled the riot, many a man had been given the gong by Davy Jones.

The tug-of-war, the main event of the day, got off to an early start when the boys forgot the last tub race in their eagerness to show their strength. The freshmen won the final contest due to their superior numbers, but the sophomores, in order to raise their ego, resorted to throwing the "frosh" into the lake. When the dust cleared, not one dry freshman or sophomore stood on the field of battle.

The last unscheduled event completed the hostilities of the day, and the drenched contestants walked slowly back to their daily routine. The final score was a tie, but due to the seniority of the sophomores, the freshmen must abide by all the rules. Totals:

	Sophomores	Freshmen
Wrestling ..... (3 bouts, 10 points each)	25	5
Tub races ..... (2 races, 10 points each)	10	10
Tug-of-war ..... (20 points to winner)	0	20
	—	—
	35	35

CHEMICALS IN WAR

(*Continued from Page 8*)

ylchlorarsine is thus obtained.

The very low volatility of this substance makes it very difficult to set up a lethal concentration and there were few deaths from this gas in the World War.

B. *Diphenylaminechlorarsine*
($(C_6H_4)NHAsCl$)

The Allies, in seeking a compound similar to that mentioned above, discovered this excellent chemical agent known as "Adamsite," after its American discoverer, Major Roger Adams. It differs from the German compound only by the addition of an amino (NH_2) group to the latter compound. While this chemical difference is very slight, it immensely simplified the problem of manufacture, since all that is required is to mix together and heat diphenylamine and arsenic trichloride and a smooth reaction proceeds. The two ingredients used are obtainable in large quantities.

Besides its value as a chemical-warfare agent, diphenylaminechlorarsine has been found to be very effective in suppressing riots and civil disturbances. For this purpose it is usually mixed with tear gas. (See Chloracetophenone).

Incendiary Agents or Smokes

Smoke is used to "blanket" the enemy by blinding him or restricting his observation and to "screen" by laying a cloud close to friendly troops. Smoke has been used with great effectiveness on both land and sea.

A. *Crude Oil.*

The smoke produced from crude oil may be generated in three ways:

1. The oil may be evaporated by heat and condensed again in the air to form small droplets.

2. The oil may be only partially burned, the carbon thus separated in solid particles which at first float in the air and form a dense smoke. The solid particles soon coagulate into flakes that quickly settle out and drop to the ground.

3. The best method is a combination of the first two; i.e., there is an imperfect combustion of the oil and at the same time an evaporation of the excess oil.

B. *White Phosphorus.*

This smoke is produced by burning phosphorus in air, forming phosphorus pentoxide. It is the best smoke producer, pound for pound, of any known material.

C. *Sulfur Trioxide* (SO_3)

This is prepared by passing a mixture of sulfur dioxide and oxygen over a catalyst at a temperature of from 400° to 450°C. The effectiveness of this smoke depends upon the humidity of the air.

D. *Tetrachloride Group*
($SuCl_4$, $SiCl_4$, $TiCl_4$)

This group forms very effective screens. The Chlorides are formed by direct chlorination of the metal.

Conclusion

One of the purposes of this paper was to demonstrate the importance that the chemical industry holds in warfare. However, warfare also holds an important part in the development of the chemical industry. The World War in many respects was responsible for the tremendous advance of the chemical industry in the United States.

On The Football Front

with Raymond C. Hogan, c., '41

At the close of the summer vacation Rose football candidates returned to the campus to prepare for a long, hard schedule. For the first time in better than ten years the Engineers will play nine games in the season. On September 6 and 7 equipment was drawn, and on the following day practice drills, two a day, were in order. Because of intense heat and the late arrival of several of last year's veterans little was accomplished other than conditioning during the first week. When school opened on September 14 the squad numbered twenty-six men, sixteen of whom were returning lettermen. Since there was such a short time before the opening game, practice sessions were necesarily devoted to fundamentals and plays, and as the first game grew nearer the Engineers, with a pony backfield ready to break loose at any time behind a heavy, experienced line, looked eagerly to another successful season.

On September 23 the highly-touted Little Giants of Wabash came to Rose Field. The Engineers wanted to avenge the crushing defeat which destroyed their championship aspirations last year, but when the final whistle blew the result was a scoreless tie. Although first downs were six and six, the Engineers' superiority was evident. Until the final moments of the ball game Wabash failed to pass the 20 yard line and only twice did the Little Giants threaten to score, whereas Rose had four scoring chances and spent most of the afternoon on the Wabash side of the field.

After receiving the opening kick-off Wabash ripped off three straight first downs before Rose finally braced on her own 25 yard line. The rest of the quarter saw the teams battle back and forth in the center of the field. Shortly after the second quarter began, Bowsher, Rose right half back, recovered a Wabash fumble on the Rose 40. A pass, Michaels to Colwell, netted 22 yards. Then Bowsher and Brittenbach ran the ball to the Wabash 26, but the attack bogged down when two line plays failed to gain and two passes fell incomplete. Again Michaels launched a scoring attack with a heave to Brittenbach who was downed on the Wabash 30 yard line. Colwell grabbed another pass for nine yards, but Lookabill intercepted a third for the Little Giants to stop the Engineers for the second time. As the half ended Wabash blocked a punt deep in Rose territory but the gun went off before play resumed.

In the third quarter, after an exchange of 60 yard punts by Gray of Wabash and Colwell, Rose started another drive from midfield. Brown sped off tackle for six yards. Michaels shot a pass to Bowsher for eleven more, and then threw again, this time to Brown, who was finally brought down on the four yard stripe. Four line bucks gained three yards and Wabash took the ball on downs. Two other scoring attempts failed when Eder missed place kicks, first, from the 25 yeard line and later, from the 12. In the final moments of the game Wabash rallied, carrying the ball to the Rose 5 where Eder intercepted a pass.

Rose fans who may have been disappointed at the outcome of this game really have something to look forward to. The Engineers showed in Michaels a dangerous passer and in Colwell, Bowsher, and Brown fine receivers. The line showed surprising defensive strength and should improve as the season progresses.

The remainder of the schedule is as follows:

Sept. 30—Evansville—there.
(Evansville, Ind.)
Oct. 7—Union (Ky.)—here.
Oct. 14—Franklin—here.
(Homecoming)
Oct. 21—Open.
Oct. 28—Earlham—there.
(Richmond, Ind.)
Nov. 4—Milton—there.
(Milton, Wis.)
Nov. 11—Hanover—there.
(Hanover, Ind.)
Nov. 18—Iillinois Colle[illegible]—there.
(Jacksonville, Ill.)
Dec. 2—Holbrook—here.

WABASH SOUVENIRS

Scene left: No off-side penalties here.

Frosh kowtow to Rosie.

Scene lower: Full speed ahead.

Here and There With the Grads

edited by John E. Bartmess, m., '41

William Henry Boehm

In 1891—17 years after the founding of the engineering school in Terre Haute—William Henry Boehm was graduated with a B.S. in mechanical and electrical engineering. Mr. Boehm's exposure to learning, however, was not initiated nor terminated at Rose, for, before coming to Rose he had training in architectural and mechanical draftsmanship, and after graduation from Rose he attended Cornell University (1891-94) and received the M.M.E. in engineering, surveying, and bridge design.

Mr. Boehm's vacations were not spent following the doctrines of hedonism, like so many another college youth, but were spent in the more fruitful policy of practice along the lines he was to follow in later life. Mechanical drafting; indicating, setting the valves, and testing steam engines; preparing estimates and bids for structural work; and inspecting products during construction; all of these activities played an important part in his summer training.

In 1894 Mr. Boehm accepted an instructorship in mechanical engineering at Washington University in St. Louis, which was followed in 1897 by the position of professor and dean of engineering at Clemson College of North Carolina. This part of his life as instructor and professor broadened his scope of both engineering and business knowledge.

The year 1901 saw his resignation from the professorship at Clemson and his acceptance of the position of vice-president of the Fidelity and Casualty Company; but this change to business did not mean the end of his engineering career, for he was in charge of boiler and machinery insurance. In his connection with boiler insurance, Mr. Boehm originated "flywheel insurance" out of which grew engine and turbo-generator insurance, and later power- machinery insurance, which has been adopted by all of the casualty insurance companies.

It was because of this work that Mr. Boehm, in 1911, was appointed by Colonel E. D. Meier, President of the A.S.M.E., as a charter member of the Boiler Code Committee. This committee had an important work cut out for it in the standardization of boiler laws. All parts of the country had various laws which resulted in irksome confusion to the manufacturer, the inspector, and the insurance agent. Mr. Boehm has been an active member of the Boiler Code Committee for 28 years and has fought, with his associates, to standardize boiler laws, so that today the Boiler Code has been incorporated into the laws of 24 states—all states that have boiler laws—18 cities, the Panama Canal Zone, and the Hawaiian Islands.

On April twenty-eighth of this year the A.S.M.E. Boiler Code Committee held a "Special Session" and dinner honoring Mr. Boehm for his 28 years of service. At this session Mr. Boehm was made an honorary member of the Boiler Code Committee.

Mr. Boehm is also known for his books *Steam Boiler Explosions, Power Machinery Accidents,* and his contributions to the current edition of *Kent's Mechanical Engineer's Handbook.* Mr. Boehm is so important in both the engineering and insurance worlds that his biography appears in *Who's Who in Engineering,* and *Who's Who in Insurance,* as well as in *Who's Who in New York, Who's Who in the East, Empire State Notables,* and *Biographical Encyclopedia of America.* He also received a full column in the June issue of *Mechanical Engineering* in praise of his work on the Boiler Code Committee.

Pittsburgh Rose Tech Club Meets

Monday, May 8, saw the regular meeting of the Rose Tech Club of Pittsburgh meet at the University Club of that city. The usual get-together was held at 6:30 p. m. with the following members and guests present:

Brent Wiley, '98; A. W. Worthington, '06; Fred J. Frisz, '09; Guy V. Woody, '09; Authur G. Butler, '10; Edw. J. Ducey, '11; W. W. Reddie, '12; Sam M. Fink, '15; H. M. Leathers, '14; H. E. Ransford, '14; W. L. Woody, '14; R. D. Leitch, '16; J. H. Overpeck, '16; R. A. Weinhardt, '16; K. L. DeBlois, '22; G. R. Fitterer, '24; L. S. Maehling, '24; W. L. Hellis, '27; T. L. Barrett, '28; Jas. E. Ducey, Ex-'40.

The dinner meeting started at 7:00 p. m., after which Mr. VanPelt of the Association of Iron and Steel Engineers, who was present as a guest, acted as operator of the moving picture equipment which he furnished.

Departed

Philip A. Newhart, '11, died May 24, 1939, at the Union Hospital, Terre Haute. Before his death, Mr. Newhart was associated with the Carnegie-Illinois Steel Co. of Gary, Indiana.

Thomas Eustace Maddex, '11, was instantly killed in an automobile accident near Gibson City, Illinois, on August 8, 1939. Mr. Maddex had been Electrical Engineer for the Central Illinois Public Service Company, Springfield, Illinois, for the past 19 years. He was a member of the Springfield Engineers Club and Terre Haute Lodge No. 19, F. and A. M. Funeral services were held on August 10th at Laurel M. E. Church, with Masonic rites at cemetery. Mr.

Maddex is survived by the wife, Blanche E., and two children, Marjorie and Robert. His mother, Mrs. Elizabeth Maddex, and brother, W. Rolland Maddex, '09, reside at Richmond, Indiana.

Roy Hamilton Jackson, '08, of North Fruitridge Ave., died September 5, 1939, at the United States Marine Hospital in Evansville. Mr. Jackson was an assistant mining engineer of the Federal Board of Health and a member of the Central Presbyterian Church. Surviving are the widow, Anne; one son, Richard; two daughters, Mrs. Milward Froberg of Milwaukee, and Barbara, at home; the father Charles Jackson, at home; and one brother, James Jackson, '06, of North Chicago. Funeral services were held at the H. P. Martin Funeral Home, the Reverend L. O. Richmond officiating. Burial was at Highland Lawn Cemetery.

The Knot has Been Tied

Max S. White, '29, was married May 27 to Miss Moscelyn Smith of Lebanon, Ind.

Frank Mansur, '34, was married to Martha Virginia Sharpley on August 31. The marriage took place at Laguna Beach, California.

Les Infants

John H. Montgomery, '35, is the parent of a daughter, Ann Price, born July 8, 1939.

Hey Grads

How about some cooperation on *your page?* You know you make the news and I am supposed to write it, but I can't without your help. So please write and tell me what you are doing, what additions —or subtractions—you would like to see on the "Grad page." And you wives, children, and sweethearts, if you have a pet story on the "old boy" send it in and I will print it too —if it is not censored.

—*Alumni Ed.*

What They're Doing

'02 John A. Nicholson with the Union Pacific has been transferred to Omaha.

'06 Knowles D. White of Walker Electrical Company has moved to Atlanta, Georgia, general offices of the firm.

'10 Ben G. Elliott is co-author, with Earl L. Consoliver (not of Rose), of *The Gasoline Automobile,* a mechanical engineering text. Mr. Elliott is an Associate Professor of Mechanical Engineering at the University of Wisconsin.

'15 Edward J. Hegarty is Merchandising Manager for the Mansfield Tire and Rubber Co., Mansfield, Ohio.

'26 Ralph W. Tapy has gone to New Mexico University, Albuquerque, as Acting Head of the Department of Electrical Engineering.

'27 Arthur F. Reinking who is with the Worthington Pump Company has been transferred to Detroit.

'29 Allen W. Reeves who is employed by the Illinois Highway Commission, is stationed at Neoga, Illinois.

'30 George M. Renfro, Jr., is in the Soil Conservation Service at Sebree, Kentucky.

'31 Anthony G. Blake, M.S. (M.I.T., '32) has taken a position with the Wabash Federal Savings and Loan Association of Terre Haute.

ex-'31 Russell Williams is City Engineer at Washington, Indiana.

'32 Robert C. Moench has taken a position with the Stewart-Warner Corporation of Indianapolis, Indiana.

Clifton A. Pratt has taken a position with the Pittsburgh Limestone Corporation at New Castle, Pennsylvania.

Bertram M. Menden who is with the Airtemp Corporation has been transferred to Detroit.

James F. Guymon, who has been awarded his Ph.D. from Iowa State University, Ames, Iowa, has accepted a position with the University of California experiment station.

Wayne R. Dickerson associated with Commercial Solvents has been transferred to Terre Haute.

'34 Howard C. Barnes has accepted a position as Assistant Electrical Engineer with the Ohio Power Co. at Canton, Ohio.

Jack Newson is employed by the Link Belt Corporation at Indianapolis, Indiana. He formerly was an instructor in the Test Department at Purdue University.

Richard K. Toner, who received his Doctor's degree in June at Purdue, has accepted a position in the Department of Chemistry and Chemical Engineering at Lehigh University, Bethlehem, Pennsylvania.

'35 Robert B. Asbury who is with the Greybar Electrical Company has been transferred to Atlanta, Georgia.

Norman H. Cromwell has received his Ph.D. from Minnesota and has taken a position with the Union Oil Company at Long Beach, California.

John A. Cushman with Joseph E. Seagram and Sons, Inc., has been transferred to Louisville, where he is Superintendent of Maintenance.

John A. Straw has a position as instructor in mathematics at Speed Scientific School.

John H. Welsh is Secretary-Treasurer of the Parlser Miller Heating Company, Inc., Louisville, Kentucky.

Arthur W. Hess, who graduated with high honors, has accepted a position with the N. P. Severin Company as Engineer and Assistant Superintendent at Fayetteville, North Carolina.

'37 Carl R. Wischmeyer, who was Laboratory Assistant in Electrical Engineering at Yale University, has accepted a position as instructor in the Electrical Engineering Department at Rice Institute, Houston, Texas.

'38 Charles E. Cantwell is employed by the Link Belt corporation at Indianapolis, Indiana.

Wendell E. Carroll with Bell Telephone was transferred to Milwaukee in June, 1939.

Lawrence J. Giacoletto has a teaching assistantship at the University of Michigan.

'39 Richard D. Altekruse has accepted a position with Seagram and Sons, Incorporated at Lawrenceville, Indiana.

Gene E. Petty has taken a position with the Arkansas Fuel Oil Company at Shreveport, Louisiana.

Franklin G. Doenges is employed by the Public Service Company of Indiana as Junior Power Sales Engineer at Indianapolis.

Carl G. Planck is the principal of the James Simones School at Charleston, South Carolina. He received the degree of Master of Education from Duke University in June, 1938.

GREAT MEN OF SCIENCE

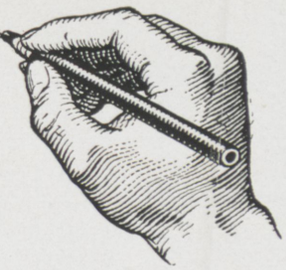
(*Continued from Page* 14)

the sun rotates on its axis. Here we have the first telescopic discovery of a sunspot, one of those gigantic whirlpools of solar activity so intimately associated with electrical disturbances upon the earth.

To his credit, Galileo attacked the problems of mechanics with the laboratory method. Using inclined planes to diminish velocity, he worked out laws of falling bodies. For the first time he demonstrated that the path of a projectile is a parabolic curve. With wonderful clearness he saw the truth of the fundamental laws and came very near stating them. He formulated the laws of the pendulum's motion, made the first thermometer and attempted to measure the velocity of light.

A many-sided man was this simple scientist of Pisa, Padua, and Florence. Musician, scholar, teacher, mathematician, physicist, inventor, and astronomer, he stands forth now, after a lapse of three centuries, as one of the intellectual leaders of all time. We are today but carrying on the work that he began. And when, with each more powerful telescope, we push back the frontiers of the universe by a few billion miles, we are adding to the luster of the accomplishments of this master from the Italian hills.

Fraternity Notes



Alpha Tau Omega

Gamma Gamma chapter of Alpha Tau Omega held the first meeting of the year on Tuesday, Sept. 19. Stanley Craig, Worthy Master, extended a brief welcome to the returning members of the chapter and announced that three new pledges had accepted pledge buttons during the summer. The chapter would like to congratulate James R. Brown, William M. Hochstetler and Robert E. Miller upon assuming pledgeship. The addition of the three pledges brings the total chapter strength to 34 actives and 6 pledges.

The chapter would like also to note the rise of Maurice W. Cannon and Frank G. Pearce to the positions of editor and business manager of the *Modulus*. The appointments were made at the close of school last spring. Brothers Maurice Fleming, Charles Howlett, and William Leedy were elected to hold offices in the Rose Rifle Club at a late meeting of last year.

Maurice Fleming and Robert Colwell deserve at least a little backslapping for their summer performances with rifles. Both distinguished themselves in marksmanship at Fort Knox, Kentucky and were appointed to the team that represented the Fifth Corps area at Camp Perry, Ohio. After two weeks of training and shooting there, Fleming and Colwell finished fourth and fifth, respectively.

Maurice Cannon, after several terms of active work in the Camera Club, was elected president of that organization Thursday, Sept. 21. Brothers William Hales and Lewis McWilliams were elected secretary-treasurer and supply keeper.

At the meeting Robert Phelps, who represented the chapter at the fraternity's Diamond Jubilee Congress, held in Richmond, Va., was called on to relate his experiences. The program of the Congres included a trip from Richmond to the birthplace of the fraternity at Virginia Military Institute; unveiling of a memorial; a trip to the Natural Bridge in Virginia; a banquet; and a grand ball. In addition there were luncheons, smokers and business meetings.

Bob brought back several suggestions for improvements of the chapter policy, among which was that of becoming better acquainted with the members of the alumni chapter. As an effort toward this end the chapter has made plans for a smoker to be held at the hours following the Homecoming football game. Refreshments will be served, and all chapter alumni are cordially invited to attend.

Lambda Chi Alpha

At the ninth Grand Council of Theta Kappa Nu, action was taken to unite the fraternity with Lambda Chi Alpha. The name of Lambda Chi Alpha was chosen for the new fraternity because it is some twenty years older than Theta Kappa Nu. The united fraternity has 106 chapters in 39 states.

There are now seven chapters of Lambda Chi Alpha in Indiana. These are located at Indiana University, DePauw University, Butler University, Purdue University, Wabash College, Hanover College, and Rose Polytechnic Institute.

The Rose chapter shall be known as Theta Kappa Zeta of Lambda Chi Alpha.

The president of the local chapter, Robert Ringo, attended the Ninth Grand Council in Birmingham, Alabama, this summer.

On Friday, September 29, the actives and pledges of Theta Kappa Zeta enjoyed a chicken dinner at the home of Mr. Ringo.

Theta Xi

Members of the Kappa chapter of Theta Xi returned after a successful summer to their improved house in Terre Haute. At the present time, several plans are under observation for further facilitating the studying and living conditions at the house.

Theta Xi is proud to announce that four more men were pledged at the end of last year. These were: Ralph Elmendorf, Evansville, Indiana; Bradford Sullivan, Macomb, Illinois; Marion Foley, Decatur, Illinois; and David Demaree, Bloomington, Indiana.

Theta Xi celebrated its diamond anniversary this summer at a national convention held at Rensselaer Polytechnic Institute at Troy, New York—the birth-place of this historic fraternity. All chapters and alumni clubs were well represented at this convention. Scholastic, financial, and popularity ratings of each chapter and club were given, followed by discussions of methods for the improvement of each. Also, future business of the fraternity was presented. The next convention, to be held in 1941, was voted to take place at Houston, Texas. Also, elections for the officers for the next two years were held; both Clayton Allen and Harold Davison were re-elected as president and secretary, respectively. At this meeting, Phi Nu Delta, a

local fraternity at the University of Southern California, petitioned for admission into Theta Xi. A similar petition was presented by a group of students at Mississippi State College. These petitions were discussed and passed on, granting these groups charters.

On Monday evening, September 18, at 7:30, the first official meeting of the year was opened. At this meeting, future business and functions were presented and approved. They are as follows: frequent open houses, a dinner meeting once a month for all members, and several other social functions to be given from time to time.

Sigma Nu

The Beta Upsilon chapter of Sigma Nu opened its fiscal year very auspiciously with a dinner at the chapter house. The chapter came back as strong as last year except for the brothers lost by graduation. There will be a formal initiation in the near future, and the number of active members will exceed that of last year.

The members were pleasantly surprised to come back this fall and find that the house had been completely renovated. The wood-work on the exterior of the house had been painted and the interior completely redecorated.

John W. Quinn, Commander, attended the bi-annual national convention of Sigma Nu, which was held in Colorado Springs this summer from August 28 to September 1. Quinn narrated many interesting facts of the meeting. He also mentioned that the attendance this year was the greatest it has ever been at the fraternity's national convention.

The social season for the chapter this year is rapidly taking shape, and the chapter is endeavoring to continue to promote good feeling between the neighboring schools by inviting fraternities from Indiana State Teacher's College to attend our open houses and enjoy other functions.

RECENT TRENDS IN AUTOMOBILE DESIGN

(*Continued from Page* 6)

ing over thirty miles per hour and is in the overdrive gear, if direct drive is needed, as in the case of a hill, it is easily accessible.

Chassis Design

Since the bodies of most automobiles have been lowered it has been necessary to make several changes in the construction of the chassis.

The greatest change in chassis design is that of wheel suspension. The trend is definitely toward coil-spring, independent front suspension. With this type of suspension, the front axle has been eliminated, thus each front wheel operates independently of the other. Also, this suspension gives the front wheels freer action which results in increased riding comfort. Two manufacturers have installed coil-spring, rear suspension this year. Most of the other models still continue to use the leaf type springs in the rear.

The main development in brakes is the switch of the Ford Motor Company to hydraulic brakes. These new brakes are the self-energizing type which gives very easy pedal action. Practically every 1939 automobile is equipped with hydraulic brakes, except those in the maximum price range.

The steering mechanisms have been improved so much that it makes driving almost effortless. Steering gear ratios have been increased along with a trend toward cross steering in which the steering pitman moves in a transverse instead of a longitudinal direction.

Body Design

The trend in design of the chassis and engines of the late model automobiles has been shown. The greatest change in design, however, has been that of bodies. The bodies of some models have been radically changed, while others have been only moderately changed.

Since most people purchase automobiles according to the appearance of the car, it is obvious that greater developments would be made in body design.

The present trend of good body design is toward simplicity. This is obtained by combining two or more parts into one and reducing the number of projections and attachments on the outside of the car. In general, the bodies have been lowered and widened, fenders have been made more massive, and headlights and other projections have been re-

cessed, either in the fenders or body surfaces. The majority of present cars have low bodies, beautiful sloping backs, and a refreshing front end treatment reminiscent of a graceful speed boat. Several models have discontinued the use of the projected trunk in the rear. The trunk is now merged in the smooth, tapering back. Another feature of design is better vision by means of larger windshields and windows.

A noteworthy advancement in body design is the fresh-air ventilating system. The ventilating unit is located in the front floor pan under the left front seat. The mechanism consists of air-filtering, heating, and ventilating units which draw air through a duct, with several openings, in the sill panel just above the running boards. The conditioned air is discharged from beneath the front seat into the front and rear compartments of the car. It is said that this unit produces a temperature of 70 degrees Fahrenheit in winter. In warm weather the heater can be shut off and the unit will draw and filter fresh air. It is possible to drive with the windows closed in the summer, as this unit provides sufficient fresh air.

All bodies have been moved forward in order to distribute the weight between the front and rear wheels. This results in increased riding comfort. The bodies have also been insulated from noise and vibration. Road noises have been eliminated by placing live rubber between the body and frame. Special emphasis has been placed on the quietness of the interiors, and it is claimed that with windows closed it is possible for passengers to converse without raising their voices, even at 70 miles per hour.

The improvements of body interiors have kept pace with the other improvements. Bodies have constantly been widened until three people may be seated comfortably in the front seat. The front seats are also adjustable. Now they may be moved forward and raised at the same time. Many obstructions have been removed from the interior of the car. The gearshift lever has been removed and the hand brake lever has been placed under the left side of the instrument board. Most of the instrument boards are made in three separate die-cast units: one for the instrument group; one for the center radio assembly, with built-in speaker grille; and one for the glove compartment door. All instruments and controls are centered directly in front of the driver. One feature of Plymouth's instrument group is the safety-signal speedometer. A small light on the indicator changes color when going through different speed ranges. With a speed above fifty the indicator light turns red, thereby warning the driver of high speeds.

Safety also has been kept in mind in designing body interiors. The back of the front seat is thickly padded, control buttons are made of soft rubber, window and door controls curve back, and other obstructions have been recessed in the instrument board. Ash trays are also located in convenient places in the front and rear compartments. The body interiors have been so designed that they give the individual the convenience and comforts of home.

We have presented the major trend in design for the modern automobile. What the future will bring in automotive design is difficult to say; however, it is probable that the future will hold: (1) even wider seats and bodies than at present; (2) simplification of design by combining accessories; (3) improvement in the interior lighting in terms of foot-candles, and proper location of the lighting sources; (4) intricate parts of the car, such as headlights and heaters recessed in the body; and (5) air-conditioned bodies. It may be safely concluded, however, that the future will see greater economy of operation and more widespread use of the automobile by every one.

The average life of the modern American automobile is eight and one-half years.

THE EFFECT OF INVENTIONS ON EMPLOYMENT

(*Continued from Page 4*)

membership of the association increased by 7,658, which is an indication of the expansion of employment in the sound pictures.

Communication

In the field of communication, the introduction of the dial telephone is probably the most noted of the technological developments. Between the years 1921 and 1930 the extent of usage of dial telephones increased by 29.2 per cent in the Bell system; and although the industry absorbed approximately 25,500 workers, the loss of employment opportunities is listed as 32.2 per cent. In the statement of this case the Bureau of Labor Statistics says that the complete adoption of the dial telephone will decrease employment opportunities for telephone operators by about two-thirds. The loss of employment opportunities, however, will not keep pace with the automatic installations, because operators will still be needed for special services. In recent years the growth of private telephone exchanges has provided employment for many operators, but it is thought that these opportunities will necessarily decrease in the future.

Telegraphy has also been greatly affected by mechanization. In fact, the technological displacement of Morse operators in the principal telegraph offices is rated as high as 50 per cent, with a tendency for substitution of women for men. High-speed tickers used in giving stock-market quotations have nearly tripled the efficiency of the operators of this type since 1920. The actual displacement due to the adoption of these machines has not been determined statistically as yet, but is believed to be very great. The operators in the communications group of railroad employees have also been seriously affected by the adoption of automatic devices. The employment level of this group has dropped in the years from 1921 to 1931 by 24.2 per cent.

Power Production

The power production in the United States has grown tremendously in the last 20 years. Between 1902 and 1935 the revenue from this industry has increased from 84 million dollars to 1,921 million dollars. In 1936 over 13,100 million dollars were invested in this industry as compared to 505 millions in 1902.

This increase in investment has resulted in a much greater productivity, which the Bureau of Labor Statistics estimates as between 75 and 100 per cent in the last 15 or 20 years. Because of the tremendous expansion of the industry, however, there has been little, if any, displacement, except possibly that due to the current business depression.

Conclusions

Andrey A. Potter, President of the American Engineering Council for the year 1936-37, clearly states the benefits of invention in this quotation:

"While mechanical power has been instrumental in separating the worker from his tools and agriculture from industry, it has definitely created more callings and more employment than it has eliminated. Science and engineering, aided by mechanical power, have been responsible for the creation during the past 70 years, where nothing was before, of such giant industries as those which manufacture automobiles, radios, typewriters, talking machines, airplanes, electric refrigerators, air-conditioning equipment and telephones, as well as new utilities which are concerned with electric communication, electric transportation, and electric light and

power. These are creations, not mere developments. These have not displaced labor, but have added new opportunities for profitable employment and happy careers for millions of people. Power-driven machines have created in the past and will create in the future jobs which would not have existed without them."

This viewpoint of the situation finds substantial support from T. A. Boyd, who in a report to the American Engineering Council stated that the number of wage earners in manufacturing industries has increased faster—about 5 per cent faster—than the population has grown.

From the figures given in the discussion of the representative industries, it is easily seen that there still exists a serious problem of technological displacement. From the rather conclusive evidence stated above, it seems illogical to believe that the blame for this condition lies in continued invention or technological developments. Rather, it appears to be the fault of our social and economic systems, which have not been able to care for the transmission of labor from the obsolete to the newer methods and types of production.

Therein lies the real problem to be solved: inventions creating new employment opportunities will probably continue to appear; but until some economic or social adjustments are made, the volume of the technologically unemployed may be expected to continue to present a serious hindrance to the advancement of the standard of living.

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Cracked Gas

by Harold E. Bowsher, c., '42

The Scandanavian had just arrived in California, delighted at the way his new car had withstood the trials and tribulations of the trip.

"How were the roads, Hans?"

"Vell, dis guy Lincoln vas huh great engineer, but dat Frenchman, DeTour, he vas no road builder at all."

—*Exchange*

Modern Youngster: "What are prayers, Mother?"

Mother: "Prayers, darling, are little messages to God."

Youngster: "Oh, and we send them at night to get a cheaper rate?"

—*The Technograph*

Auto Salesman: "My dear sir, this car is the opportunity of a life time."

Prospect: "Yes, I can hear knocking already."

—*The Pennsylvania Triangle*

Lingerie Model: "The manager said for you to give me a pair of French panties for the ladies' emporium."

New Stock Clerk: "What size is the lady's emporium?"

—*Exchange*

"How'd you get along with your wife in that fight the other night?"

"Aw, she came crawling to me on her knees."

"Yes, what did she say?"

"Come out from under that bed, you coward."

I may be wrong, but think it over: Anybody can play bridge, but it takes a cannibal to throw up a hand.

SMALL STUFF

It's a very small river if the government doesn't think it's worth a dam.

"It'll come out in the wash," said The R. T. Engineer as he looked at the bridge he had just built.

BEWARE! DOC

The professor who comes in late is rare; in fact, he is in a class by himself.

Waiter: "Would you like to drink Canada Dry?"

R. T. Engineer: "Yeah, but I'm only here for the week-end."

—*Exchange*

UNEMPLOYMENT FACTOR

Jones was showing his wife and her friend around the new offices. He left them in the reception room while he answered a telephone call, and the conversation between the two women drifted to household matters.

"Have you put up much fruit this year?" asked the friend.

"Not very much so far," answered Mrs. Jones, as her gaze wandered to several pretty stenographers, "but I intend to can some peaches very soon."

"Why does a watch keep better time in March than in October?"

"Because a spring is better for it than a fall."

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"Were you excited when you first asked your husband for money?"

"Oh, no, I was calm and collected."

Judge: "Is your wife dependent on you Mose?"

Mose: "She sho is, Jedge. Ef Ah didn't go out and get washin's she'd starve plumb to death."

AN AMENDMENT

Jane: "I see where there has been a bill introduced to abolish sleeveless dresses.

Joan: "That would be unconstitutional—the constitution gives the right to bear arms."

"Why is love like photography?"

"Because it must be developed in the dark."

"Why does a woman always stand in front of a mirror when she is dressing?"

"She wants to see what is going on."

You only live once so—Work like Helen B. Happy.

A HINT

Why couldn't our Navy be like the old maid, always ready, but never called upon.

Joe, a Civil War Veteran: "Why did Gen. Lee refuse to accept that load of apples, when we were so in need of supplies?"

Pete: "They were 'Northern Spies'."

SPEED UP PRODUCTION

I see where they turn out a Ford every minute and a half. That isn't fast enough—there's a sucker born every minute.

SOME CHANGE

I saw an Englishman go in a French saloon and come out a Russian.

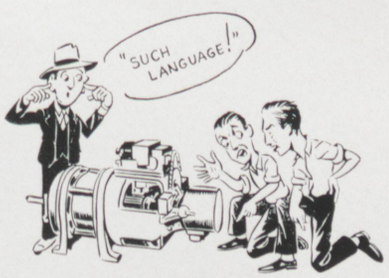
G-E Campus News

ENTERTAINING ROYALTY— BY PROXY

WHEN Great Britain's King and Queen visited the New York World's Fair on their international social call, 20 farmers were able to watch the royal pair as closely as if they were entertaining Their Majesties out on the farm. And the rural folk were 130 miles away from the Fair grounds.

This long-distance watching was made possible by G-E television engineers. Directed by C. A. Priest, Maine '25 and ex-Test man, radio engineer for General Electric, they were simply proving that television programs could sometimes be received at a far greater distance than the previously supposed limit of 40 to 50 miles.

For, instantly and clearly, while the King and Queen inspected the Fair, television reproduced complete details of their visit to the group—130 miles away, atop the Helderberg Hills near Schenectady. Not far from the scene of this experiment is General Electric's powerful new television station, W2XB, soon to go on the air.



TECHNICAL DOUBLE TALK

WALKING through one of General Electric's factory buildings, a visitor paused in front of two young men kneeling in front of an electric motor. He was mystified to hear, "Say, Bill, put a tac on that BTA, and after you've hooked up the pots and c-t's and plugged power, see if she still swings and hunts!"

All of which made as much sense to the visitor as "gate," "jive," "alligator," and similar swing-music terms mean to a symphony conductor. Translated, the young man was merely asking his co-worker to connect certain instruments to the motor, turn on the power, and notice whether the motor ran smoothly.

Few of the graduate engineers selected by General Electric for its Test Course are familiar with this Test man's jargon when they arrive. But after a few days in the shops the new man, too, is rattling away in the technical double talk as expertly as his elders.

TRAVELING HOTEL

NEXT Spring, when a hotel-on-wheels rolls into Bombay, India, some of the citizenry may have grave doubts about their sanity. Or they may blame the blazing tropical sun. They'll be wrong. Lawrence Thaw's trans-Asiatic motorcade will be completing a 14,000-mile safari from Paris.

Quite obviously, such things as 14,000-mile trips require quite a bit more than *savoir-faire* and an adventuresome spirit. Preparation, and plenty of it, was required by Mr. Thaw. This brought into the picture—both directly and indirectly—G-E engineers.

The four mobile units of the motorcade boast of the latest G-E two-way radio, for maintaining contact between the various vehicles throughout the journey. During tests two of the units maintained contact when as far as 200 miles apart. Air conditioned throughout, the deluxe trailer contains all the appliances and equipment normally found in a modern home—from tiled bath and indirect lighting to an array of electric appliances.

GENERAL ELECTRIC

90-181C

FOR REAL MILDNESS

Swing to Chesterfield

Yes Sir-e-e! Chesterfields take the lead for mildness . . . they take the lead for better taste. With their right combination of the World's best cigarette tobaccos they give millions more smoking pleasure.

. . . watch the change to Chesterfield

They Satisfy